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# **Modelling the Social in Locative Media: Collaborative GPS**

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## **Abstract**

The proliferation of global positioning systems (GPS) has made it affordable to find out exactly where you are, plan routes and even draw pictures on the Earth's surface. The integration of GPS with other forms of digital technology has further extended the quantitative spatial and temporal characteristics of the system to support social dimensions. This paper focuses upon the capacity for locative media to support the social discussion of place, and identifies a technical 'hitch' in established approaches that inhibits aspects of discussion so that they only take place within given environmental contexts.

The paper outlines work by established artists / researchers who use GPS to support a social dialogue with place, and highlights a tendency in the way that the works present multiple social/spatial activities, that being that discussion is separated from the act of exploring a space. In each case, the authors find that the synthesis of collaborative reflection and being in a space occurs after the event, often back in a gallery/workshop space. In attempting to allow social reflection upon a place in 'real-time', the authors have developed a novel technical and conceptual twist on the use of GPS data that allows them to sustain live spatial/social dialogues.

## **GPS – Euclidean Maps, Masking Relative Spaces.**

To determine the position of a user in geographic space, locative media currently relies upon portable digital systems being able to receive signals from a series of satellites that orbit the earth. Known as the Global Positioning System, a network of satellites that were deployed in 1992 by the US Military constantly transmit signals back to the planet. Receivers on the ground are able to pick up signals from these satellites and determine the position of the user. Each receiver calculates its position by recording the timing of the signals that it receives from the satellites. Because the distances between the user and each satellite will be different, the receiver is able to deduce a location from the time it takes for each signal to arrive from each satellite. Consequently, the more satellites that a GPS receiver can 'see', the more accurate it will be in establishing a location. Miniaturized and neatly packaged in handheld and dashboard models, GPS has since been used for a host of purposes from locating lost vessels at sea, to tracking transportation fleets, geographical exploration and, of course, navigating us to the nearest pizza restaurant.

Whilst the basic principle of GPS is easy to grasp, the mathematics that allows the system to work on a global scale are rather more complex. Due to the nature of being on a 'not quite' spherical planet, and the affects that the speed of light and gravity

have upon time/space, GPS uses principles of general relativity to correct the satellites' atomic clocks. So whilst we often see ourselves as a pinpoint depicted in Euclidean space on our smart phones (eg. a flat Google map), Global Positioning Systems are using a relative model of reality that is subject to the activity of other bodies. A further masking of this insight into Einstein's model of a relative universe is evidenced in how the software on handheld devices or personal computers records the movement of users across the planet. Trails or paths are the linear sequence of GPS points that are recorded to evidence where somebody has been. Recorded to a database at regular intervals, trails allow people to record where they have walked, plot navigation routes and even draw pictures on the planet surface<sup>1</sup>. As GPS devices have shrunk over time, the recording of trails and users' location has increasingly been on an individual basis. Despite the introduction of GPS into networked devices such as smart phones, the majority of devices still record the user's own trail and do not compare these trails with other members of a community. This adherence to a linear model of time to document spatial activity is in sharp contrast to the relativist nature of the technology that relies upon location being contingent upon an indivisible model of time and space. The authors propose that this may also impede the true potential for locative media to develop new network experiences that may inform understanding of the environment, society and self.

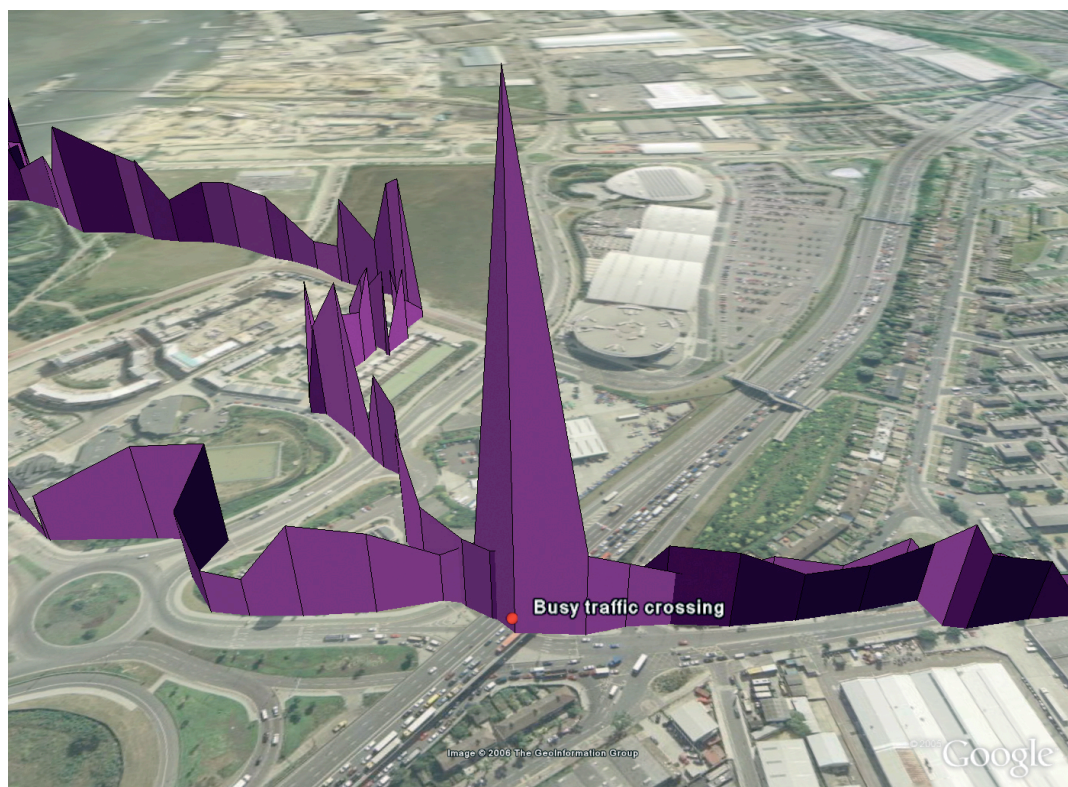
At the time of writing (July 2009), Google had recently released *Latitude* for the iPhone that allowed users to plot where a friend was in space. Whilst it is undoubtedly a significant step in integrating time with space by making a Cartesian map come to life through the introduction of social factors, it does not yet 'connect' the users in a way that supports a critical dialogue between them and allows the independent temporal models of space to become related. Aware of the potential for GPS as an instrument to support social discussion upon, in and about space, artists have recently been employing it in many different ways. The next section draws attention to three artists who have used GPS to elicit, represent and engage audiences in discussions surrounding the value of space.

### **Examples of Social Praxis within Locative Media**

In contrast to consumer-led integrations of geographical and economic data, several emerging creative approaches retain a social network in geographical contexts. These include the complex urban *Biopsies* of Christian Nold, the social and acoustic delicacy of Giaccardi's *The Silence of the Land* project, and the interconnections across Hamilton, Southern & St Amand's *Running Stitch* project. Each of these projects has utilised GPS instruments and data to provide a spatial dimension to the social experiences of both built and natural environments.

Nold is often cited because of his *Bio-Mapping* project that charts the 'arousal' of participants as they walk through built and natural environments. Using the correlation of an individual's 'galvanic skin responses' (GSR) with location through the use of GPS tracking, Nold overlays paths onto *Google Earth*, replacing altitude with the GSR data to afford an understanding of how our 'perception' of a place rises and falls (Fig 1.). In addition to telling us what we might expect, such as the indication of stress as people navigate busy road junctions, each of these routes peak and trough at unexpected and inconsistent points, demonstrating the individual

psychogeographic relationships we each have with an environment. The plotting of annotations across each path also serves to describe social practices and social relations that are evidently central to an individual's relationship with a place. Nold has recently complemented his bio-mapping techniques with further sketches, commentaries, tag clouds and geographic information from individuals who live within a specific community. Together with designer Daniela Boraschi, Nold developed a *Biopsy* for the London region of Brentford. Through a series of participatory workshops and drop-in sessions based in a local gallery, Nold and Boraschi applied a range of techniques including 'emotion mapping' and 'sensory mapping' to describe the complex range of qualities that residents understand about the area, with a view towards holding up "the complex network of local issues for all to see and reflect upon and not to attempt to untangle or resolve them" (Nold & Boraschi, 2008).



**Fig 1. Christian Nold Bio Mapping & Greenwich Emotion Map - High res Bitmap – detail, 2008**  
© Christian Nold

*The Silence of the Land* (Giaccardi et al, 2007) project (initiated by Dr. Elisa Giaccardi) uses GPS technologies in tandem with sound capture equipment to allow participants the chance to capture and share sonic experiences. Pinpointed on an online map, sounds can be listened to, commented upon and rated by members who may live, work and play around a specific geographic area. As well as being a sophisticated locative sound mapping interface, the importance of the project becomes clear when we consider how Giaccardi uses it as a platform for social and cultural mediation. While the many journeys into natural and urban environments with the 'sound camera' stimulate conversations about each member's specific sense of place, it is across the Web 2.0 interface where we begin to understand how place is subject to social differences (Fig 2.). As each participant comments and rates other people's sounds, a complex discourse emerges, describing the tensions present between the



values which differing communities place on environments. Through the web interface and workshops, *The Silence of the Land* has the rare ability to sustain social and geographical topography across a single interface.

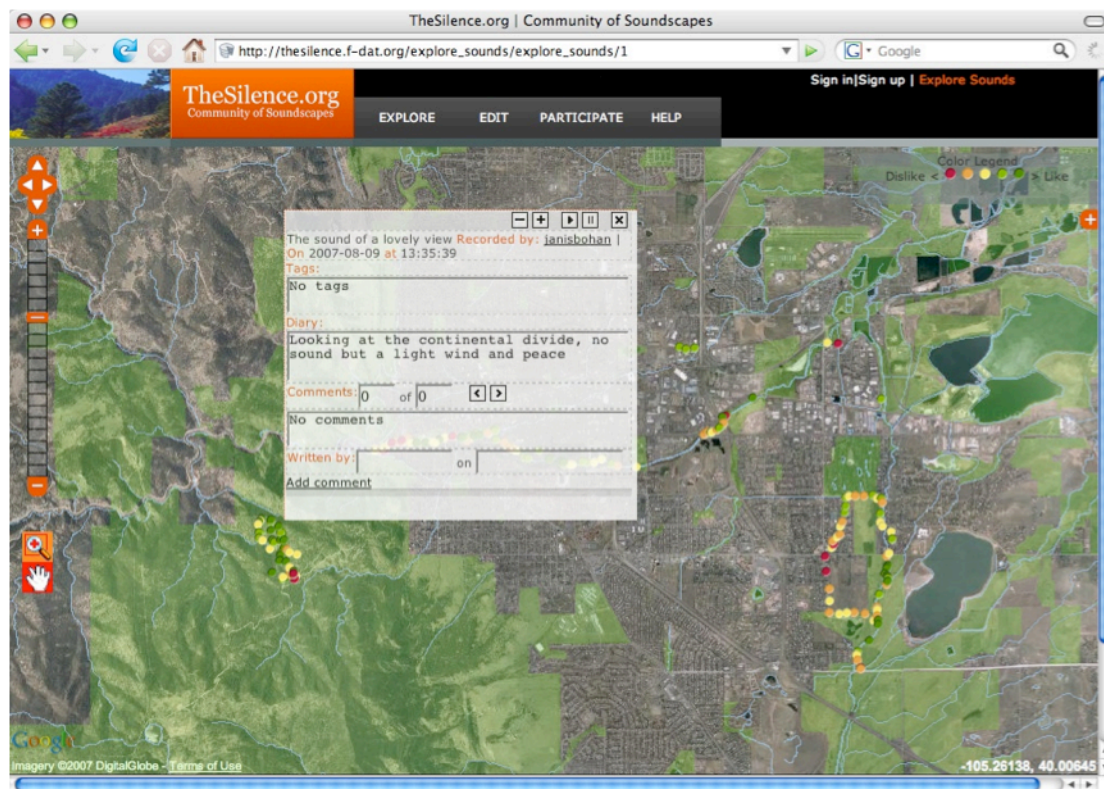


Fig 2. Elisa Giaccardi, *The Silence of the Land*, website (<http://www.thesilence.org>)

Hamilton, Southern & St Amand's *Running Stitch* presents a tension between the mapping technology employed in surveying people's movements from far above, and our apparent freedom to move on the ground. The artists suspended a five square metre sheet of canvas in a gallery space, while a visitor to the gallery sewed, in real-time, the route taken by a member of the public who was being tracked by a live GPS connection (Fig 5.). The tension created is the result of the walker acknowledging that they are leading the stitcher, but at the same time knowing that it is the stitcher who actually records and maps the routes taken (Hamilton, Southern & Amand 2006)

Like Nold's emotional maps and Giaccardi's socio-spatial mediatory platform, Hamilton, Southern & St Amand's work dismisses any 'hierarchical' model of space in which anyone is able to retain a sense of place by taking the higher ground. The specific use of GPS technologies in these instances succeed because they acknowledge the complex social, cultural and geographical dimensions involved in the production of space.



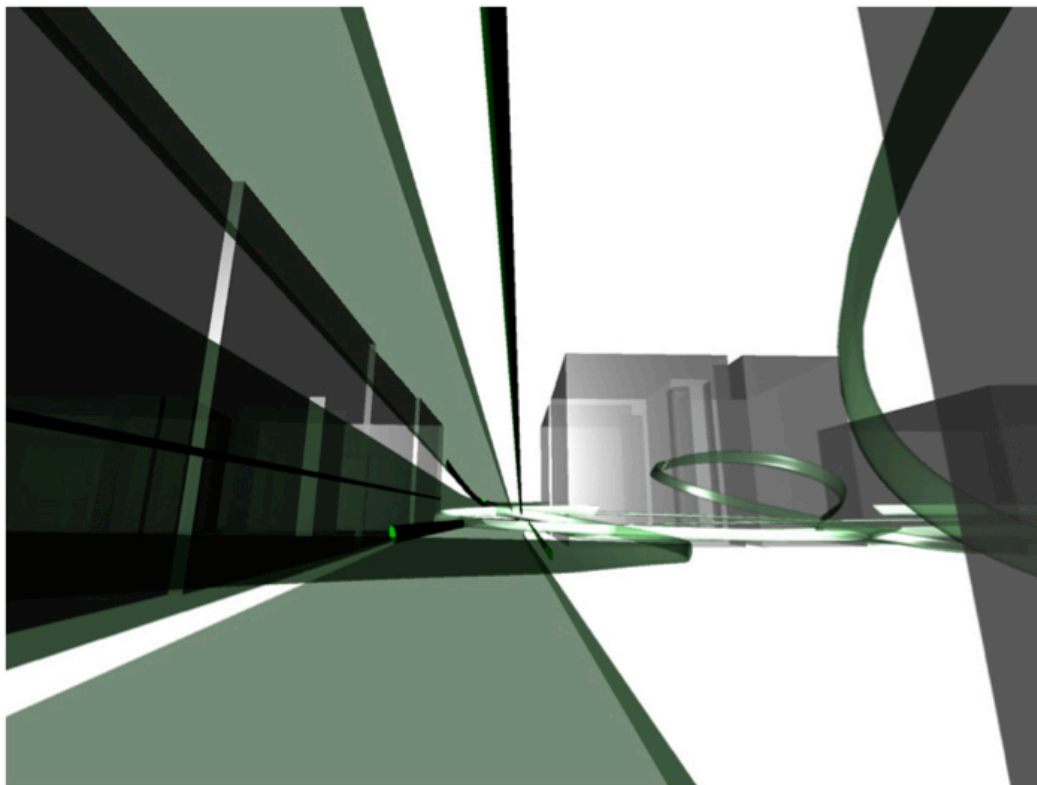
**Fig 3. Jen Hamilton, Jen Southern & Chris St Amand's *Running Stitch*, closeup. 2006 © Hamilton, Southern & St Amand**

What is particular about each of the three examples presented is the use of a 'unifying frame' within which the GPS and social components become correlated. In Nold's work, it is upon the *Google Earth* base map that we 'see' the peaks and troughs, or on the gallery wall when narratives and sketches complement geographies. In *The Silence of the Land*, the web uses a geographical base map to provide a context in which tags lead to conversations. In *Running Stitch*, it was the canvas that ultimately provided the synthesis between walker and stitcher. The use of a 'unifying frame' within each piece not only provides a context within which we can reflect, but is also essential because GPS information has been derived from the movement of individual non-networked devices. Subsequently maps or visualizations of many people's movements require data from each device to be sent back to a central database or medium upon which the disparate activities can be seen within one frame.

Due to this 'individual' monitoring nature of GPS, locative media works by Nold, Giaccardi and Southern have relied upon an external context for studying the revealed social practices away from the actual place where they took place. Sometimes this is a necessary element to support reflection. However the authors suggest that a simple solution may be at hand; don't concentrate upon monitoring the individual's spatial activity across time, monitor the group. The implications of this simple statement are better illustrated in two applications of the principle: i. an architectural field trip in which the data from GPS devices was used to model the topology of a British city, and ii. *comob* a social mapping tool that allows groups to demarcate areas of a place according to a given theme.

### **Collaborative mapping of an urban geographical and social topology**

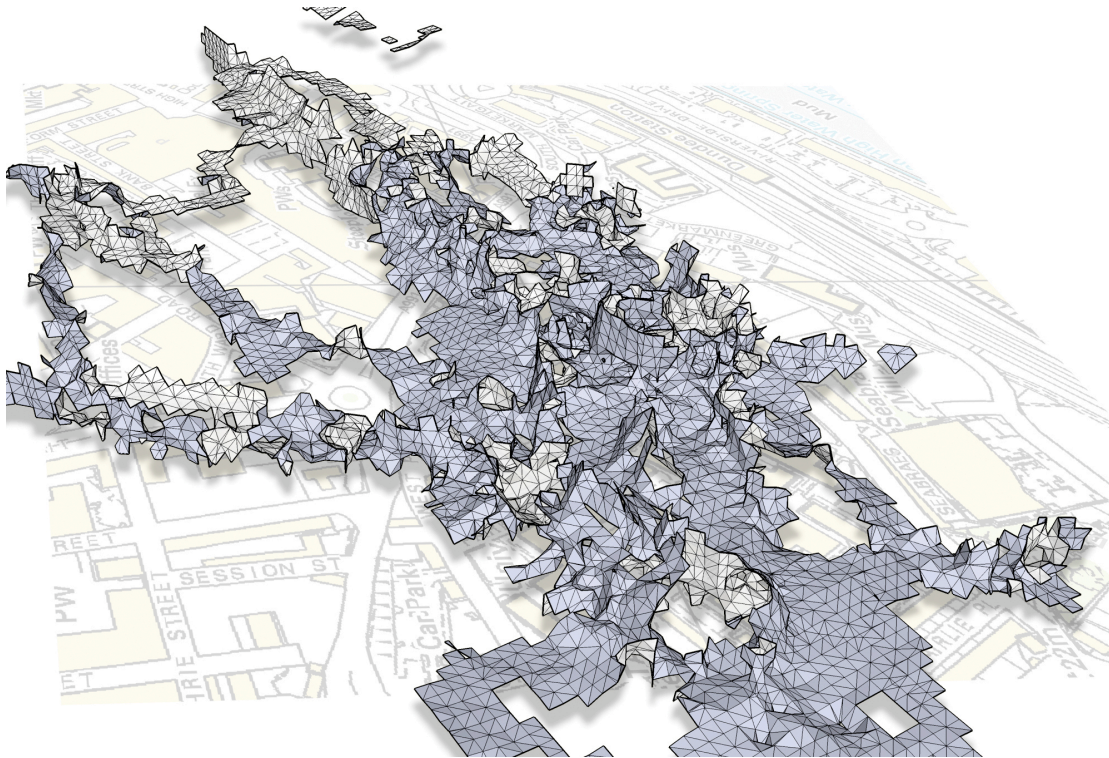
In a recent project working with architectural students from Edinburgh College of Art, Speed and Lowry established the grounds for a way of networking mobile GPS devices that would produce maps that are constructed through the navigation and movement of a body of people within an urban context. During a design project site visit to Dundee, 17 students were equipped with GPS devices and asked to explore an area specific to an architectural brief. The devices offered the students an additional method of exploration that had potential for informing the entire navigation of the context to inform a more considered and intimate design strategy than traditional recording media. Upon return to the studio, the team 'harvested' all of the waypoints and tracks recorded by each GPS. The data was used in two ways: i. to construct pedestrian perspectives of GPS tracks, and ii. to develop a topology of where the students as a whole had walked. The first procedure (fig 4.) involved importing track coordinates into a 3D software package (Rhino) and modeling them alongside a three dimensional representation of the site.



**Fig 4. Chris Lowry, Chris Speed. Digital Explorations in Architectural Urban Analysis.** Reduction coefficient introduced to counter GPS elevation discrepancy. © Chris Lowry 2008.

The second process involved stripping each track of its time, and constructing a new file which consisted of over 10,000 geographic points that covered the area of 'downtown' Dundee. Using a series of three-dimensional software packages, the final 'mesh' describes a social topology of the students' movements across the city (fig 5). Accurate in longitude and latitude, but flawed in elevation due to the difficulty of the GPS devices in ascertaining accurate height information the study demonstrated the potential for collaborative mapping.





**Fig 5. Chris Lowry, Dermot McMeel, Chris Speed & Mark Wright. Digital Explorations in Architectural Urban Analysis. The collective spatial activity of seventeen students from the Edinburgh College of Art, as they explore 'downtown' Dundee, Scotland. 2008 © Lowry, McMeel, Speed and Wright.**

This dynamic mapping process manifests an unusual topology; whilst not being as accurate as the painstaking process followed by civil engineers using theodolites, the resulting three dimensional forms offer an extra 'fuzzy' social dimension. Known for his faith in social networks as a framework for better 'mapping' space than Cartesian processes, Latour provides an opportunity for the inaccurate, but socially rich topological map of Dundee to gain value.

*"Once the whole social world is relocated inside its metrological chains, an immense new landscape jumps into view. If knowledge of the social is limited to the termite galleries in which we have been traveling, what do we know about what is outside? Not much."* (Latour 2005:242)

Interpreting Latour's "termite galleries" as the individual trails in which the traditional GPX<sup>2</sup> protocol stores data, we can postulate that the flawed, socially constituted points on the three dimensional map of Dundee is perhaps a clue to Latour's "new landscape". Inaccurate according to Cartesian values, but socially expressive and contingent upon the movements of people navigating their collective networks.

Since documenting the work, Speed and Lowry have initiated a live mapping version of the process that allows each user in the street to receive a real-time description of their place as a node within a mesh of other users. The application of this approach allows users to generate a reasonably accurate socio/topological map of a place quickly - one that also describes aspects of the social characteristics of a place.

## Comob

*Comob* is a method of social and spatial mapping. This software for the iPhone allows groups of people to see each other's movements represented on screen as circular nodes with lines linking their individual positions (fig 6.). This data is also sent live to visualisation software that allows observers to see their movement at a distance. Previous projects have mapped and tracked individuals, however *comob* proposes that those individual tracks are only part of how we move through space. Use of public space is a social activity, one that we do in relation to other people. *Comob* allows for observation of how movement through space is a social activity, and proposes that those movements can be used to map relationships to space.



**Fig 6. Screen Shot from Comob Net iPhone application allowing groups of people to see each others movements and link their individual positions. Developed by J.Ehnes, H.Ekeus for C. Lowry, W. Mackaness, J. Southern, C. Speed & M. Wright. ©2009**

At Futuresonic 09 in Manchester, *comob* was used for a workshop to map pollution and became a catalyst for discussion of how pollution is experienced and perceived on the ground. Tim Ingold has discussed and refuted the traditional separation of the hands and the feet as instrumental in our understanding of the world: the feet as merely technologies of locomotion, and the hands as tool-makers, manipulators and related to the mind. For Ingold, the feet are part of a whole bodily engagement with the world (Ingold, 2004:315). This perception of 'culture on the ground' is fundamental to our process: in walking in the city a greater understanding of the spatial, sensory and temporal perception of the world allows for new possibilities of mapping. This mapping with *comob* is, however, always a social negotiation of space and place, bringing, as it were, Goffman's "social public space" into the practices of GPS use (Goffman, 1963).

During the workshop it became clear that many different methods of mapping and

walking were possible. Participants would begin with a very specific idea of what they wanted to map, e.g. the visual pollution of branding, or litter, conceived of as categories before the walk began. These fixed ideas quickly became modified as the walks evolved and the original idea was explored in the actual conditions. Ingold has suggested that people do not walk through the world as if guided by a mental map, that instead they “‘feel their way’ through a world that is itself in motion, continually coming into being through the combined action of human and non-human agencies” (Ingold, 2000: 154). This feeling of the way became the method for *comob* walks, however participants that had prior knowledge of the area found themselves second guessing where they would find particular kinds of pollution, from a remembered experience of space, whereas visitors who did not know the area would make assessments based on what could be seen, heard, smelt and experienced directly. A second team at the workshops viewed the progress of the walkers as circles of light projected onto a GIS map. Annotating the map as they went, this group attempted to record the movements of the walkers. On their return the observations of both groups were discussed and drawn onto the map in an attempt to articulate the experience of ‘feeling their way’ through the environment in order to detect pollution was translated onto the fixed projection of the map. This relation of the ground to the map allowed for a discussion of the negotiations between the city and pollution as an assumption, and as a walked actuality, and a negotiation between the differing interpretations of participants with the ‘view from nowhere’, i.e. the map projection, and the ‘view from somewhere’, on the ground (Büscher, 2006:281).

### **Summary: Collaborative Mapping**

Both the collaborative socio/topological mapping of Dundee and the use of *comob* to support social negotiations of place shift the emphasis away from recording spaces in time, to concentrating upon mapping social connections. This shift supports a critical adjustment to the potential for GPS to support the manifestation of relational social activity. No longer are time and space discrete units in the measurement of location, but instead they are used along with group dynamics, giving the social dimension priority. This reconstitution of place becomes a matter of social contingency that is subject to the activities of networks of people, discussing, exploring and negotiating space together, not individually. Subsequently whilst previous creative works have been forced to represent a social dimension away from a place or out of time, the collaborative approach to GPS employed by the authors enables them to retain the focus of participant’s attentions that are in the street, back to the street, because they are able to see their attachment to one another.

Returning to the introduction, in which the authors identified how the technology of GPS is associated with Albert Einstein’s ‘general theory of relativity’ and, in contrast, how the typical use of the devices is to locate and record the activity of an individual, we can understand how Euclidean many of the representations of space and time gathered with GPS have become. The artworks, presented in the early part of the paper, that were used as examples of how GPS can support a reflective social dimension: Nold’s *Biomaps*, through Giaccardi’s *Silence Project*, to Hamilton, Southern & St Amand’s *Running Stitch*, were only able to do so once the geographical data was re-contextualised in a gallery or workshop space when the activity of the individual was compared to the activity of others. Designed to



concentrate upon only one person's path, the established method of recording single trails or single points in space is only able to document the navigation of the user and not the movement of others that influences her/him.

This 'obfuscation' of the social dimensions that influence and affect our movement across place turns a technology with a highly relativistic quality into a dumb Euclidean tool for reasserting the individual's presence as being at the centre of the universe. In his book *Out of Control*, Kevin Kelly uses the long misunderstood science of bees to explain the qualities of complex systems. Citing many instances of science focusing upon the single bee and not the swarm or hive, Kelly describes the shift in 'resolution' that is required to anticipate the properties of networks (Kelly 1994:5). As more mobile phones begin to acquire locative technologies as well as being 'hooked' up to the internet, 'real-time', 'telematic' connections between people are going to increasingly extend the ways in which our navigation in the street is affected by others. The authors' work in Dundee and the *comob* application, are both located in a relative paradigm in which the movements of the individual are connected to the actions of others in a way that acknowledges the complicity of a social network.

Whilst the collaborative approach to GPS mapping developed by the authors is in its infancy, it is already opening up new opportunities for using the technology in ways that traditional 'linear' representations could not support. Watching the live connection between yourself and others affects your navigation. By manifesting the ties between friends and colleagues, we are beginning to make evident the tensions that are usually invisible across the social networks that define our lives and produce the spaces within which we live.

## Notes

<sup>1</sup> Jeremy Wood has established an international profile as a GPS artist who draws pictures using the trails left by handheld devices see <http://www.gpsdrawing.com>

<sup>2</sup> GPX is the XML format for storing GPS data. Typically containing longitude, latitude and elevation, the data is organised according to the time stamps that allows the linear depiction of a trail of an individual in mapping applications.

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